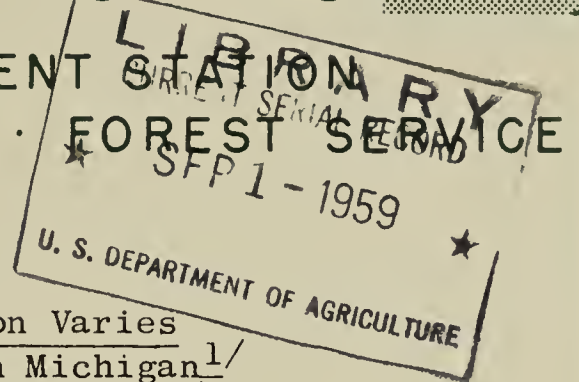


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LAKE STATES FOREST EXPERIMENT
U.S. DEPARTMENT OF AGRICULTURE



No. 564

Pattern of Soil Moisture Depletion Varies
Between Red Pine and Oak Stands in Michigan^{1/}

The conversion of low-value scrub oak to pine plantations is a common forest management practice on deep sand soils in northern Lower Michigan. The value of timber produced over the same period is much greater from these plantations than from the scrub oak type. This conversion has been found to cause no major change in total soil moisture utilization, according to studies under way by the Station in cooperation with the Michigan Department of Conservation. The change is largely in seasonal use.

The moisture contents of the sandy soils under two densely stocked red pine plantations about 25 years old and two natural oak stands 60-70 years old were sampled at monthly intervals from April through October 1958. Four samples from depths of 0-1, 1-2, 2-3, 3-5, and 5-7 feet were taken on each sampling date on 1-acre plots. Bulk density measurements and 15 atmosphere wilting percentage values were utilized to convert the percent moisture content by weight to inches of available moisture.

The difference in pattern and rate of soil moisture depletion between the two cover types is illustrated in figure 1. Soil moisture levels in both forest types were at field capacity at the beginning of the growing season. The red pine stands started using soil moisture in April and May. Soil moisture levels were lowered under this cover type at a relatively uniform rate until the moisture reserves in the rooting zone were nearly exhausted by late July and early August.

Soil moisture utilization was slow under the oak stands until full-leaf development was reached in June. Heavy rains the first week of July restored soil moisture levels to nearly field capacity although rapid moisture utilization doubtless had commenced prior to this time. During the remainder of July the rate of moisture depletion was very rapid under the oak and the moisture reserves reached the same low level as those under pine stands by August 1. At the end of the sampling period in mid-October, soil moisture had recharged to the same levels in both oak and pine areas.

The most obvious contrast in soil moisture use between red pine and oak is the early season differences in depletion patterns. Considering the entire growing season as a whole, both forest types ultimately utilize most of the stored soil moisture on sandy soils; and there is no major difference in total soil moisture utilization between these two forest types.

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^{1/} This study is one phase of a watershed research project being conducted in cooperation with the Michigan Department of Conservation.

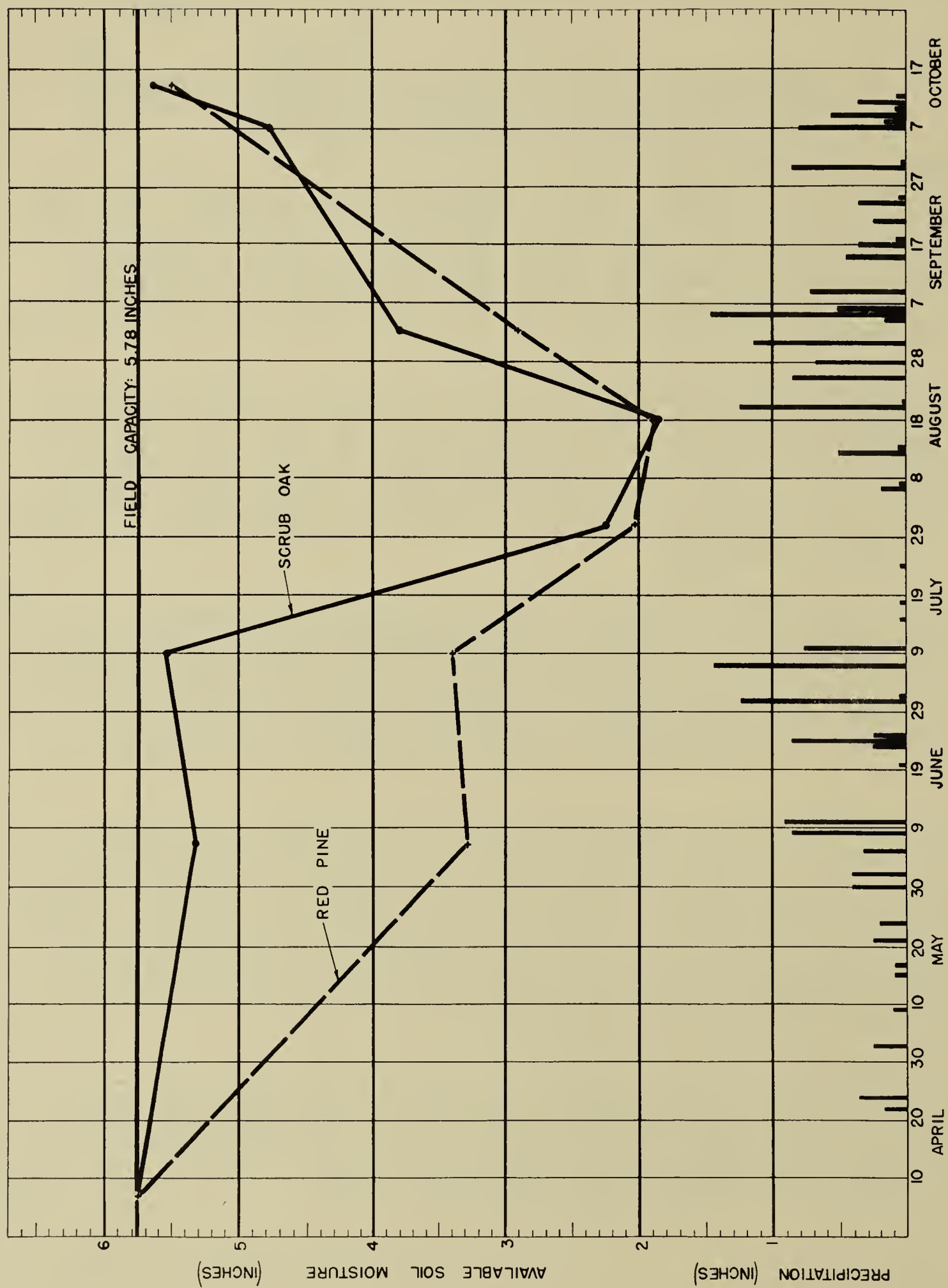


Figure 1.--Pattern of soil moisture depletion and recharge under red pine and oak stands, 1958. Measurements were made in top 7 feet of soil.